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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/040,953	01/05/2002	Steven Teig	SPLX.P0024	7746

23349 7590 07/16/2003

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EXAMINER
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LIU, ANDREA

ART UNIT	PAPER NUMBER
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2825

DATE MAILED: 07/16/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application N .

10/040,953

Examiner

Andrea Liu

Applicant(s)

TEIG ET AL.

Art Unit

2825

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 5 January 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 27-52 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 36-47 is/are allowed.
- 6) ☒ Claim(s) 27-35 and 48-52 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 02 July 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 9.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## **DETAILED ACTION**

### ***Specification***

The disclosure is objected to because of the following informalities:

Under Summary of the Invention:

Line 1: Delete "LP" and insert --linear-programming ("LP")—

Lines 8-9: Delete "linear-programming ("LP")" and insert --LP--

Appropriate correction is required.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

1. Claims 27-29, 32-35, 48, 49 and 52 are rejected under 35 U.S.C. 103(a) as being unpatentable over Anthony Vannelli's article, "An Adaptation of the Interior Point Method for Solving the Global Routing Problem" in view of Andreev et al. U.S. Patent No. 6,412,102(B1).

As to claims 27-29, 48, 49 and 52, the Vannelli reference discloses linear programming ("LP") and integer linear programming ("ILP") approaches to model circuit layout and global routing problems (pages 1 and 2). Additionally, page 1 of the Vannelli reference teaches

Art Unit: 2825

specifying a number of constraints as well as ensuring that various areas are not overcongested, as set forth in claims 32-35.

However Vannelli does not explicitly teach solving the LP or ILP problem by formulating it based on the identified propagation possibilities of a second set of smaller sub-regions after the region of an design layout was partitioned by a router into a first set of sub-regions, which are subsequently partitioned to form the second set of smaller sub-regions.

Andreev et al. disclose a method for routing optimization that comprises partitioning the layout region into a first set of sub-regions and then the partitioning of that first set of sub-regions into a second set of smaller sub-regions (columns 2 and 3), and identifying a plurality of propagation possibilities for propagating each route into the second set of smaller sub-regions of the first set of sub-regions (columns 1 and 2).

Accordingly it would have been obvious to one of ordinary skill in the art at the time the invention was made to formulate a LP problem based on the propagation possibilities identified after the partitioning steps because dividing regions often significantly reduce the processing time required to re-route large nets because the wirelengths are minimized, leading to reduced area (column 7). Furthermore, using different area configurations tends to disperse routing away from overly congested areas, resulting in the ability to re-route using parallel processing on certain areas, while simultaneously allowing connections to be re-routed to different sections of the chip (column 7). Since running times can be excessively long if an LP approach is

Art Unit: 2825

performed large areas, the reduction of the area and congestion would contribute to a shorter processing time, which serves as the motivation for combining the limitations set forth in the claims.

2. Claims 30, 31, 50 and 51 are rejected as being unpatentable over Vannelli in view of Andreev et al., as applied above, and further in view of Teig et al. U.S. Patent No. 6,516,455.

The Vannelli and Andreev et al. references teach a method of propagating the route comprising solving the LP problem over partitioned sections. However, they do not teach computing the cost of each identified propagation configuration.

Teig et al. disclose a cost-calculating function to measure the quality of the initial placement configuration (column 2). Therefore it would have been obvious to one of ordinary skill in the art to integrate this step into the invention so as to generate a metric score that is indicative of the placement quality, which is crucial to the overall process of optimizing routing.

Art Unit: 2825

*Allowable Subject Matter*

1. Claims 36-47 are allowed.

The primary reason is the inclusion of identifying and solving the LP or ILP problem to select one identified propagation permutation for each route in each sub-region traversed by the route within the method of routing nets, which is not found in the prior art.

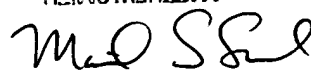
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Andrea Liu whose telephone number is (703) 305-4041.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Smith can be reached on (703) 308-1323. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 305-3431 for regular communications and (703) 305-3432 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-1782.

Andrea Liu

Patent Examiner

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